

Product Bulletin

Number: 2000-072

Date: June 2000

Remote Office 9150

General Availability

Meridian Remote Office 9150 and Remote Office Reach Line Card are available in Canada and the United States on Meridian 1 PBXs.

They are under controlled release until M39xx Release 2 support is available. This is expected in the middle of August.

Pricing information for the product can be found in the April, 2000 US and Canadian Meridian 1 Product Catalog. The Meridian Remote Office 9150 is planned for the MSL-100 market, with a 4Q2000 availability timeframe. Field Trials are presently being conducted.

What is Remote Office 9150?

Introduction

Remote Office 9150 is a product that provides full-featured host Meridian 1 PBX services to as many as 32 users located in your office.

The Remote Office 9150 unit uses Voice over IP technology to route voice conversation and phone set control signals between your office and the host PBX over your existing IP data network.

The Remote Office 9150 unit can also use a circuit-switched network to route calls if the Voice over IP quality degrades below predefined thresholds.

In this case, Nortel Networks' patented QoS transitioning technology automatically transitions calls to the circuit-switched network when the voice QoS degrades. Calls transition back to the IP network when the QoS returns to normal.

You can configure the Remote Office 9150 unit to use only the circuit-switched network, and implement the IP network functionality when you are ready.

This document provides a brief description of each component used in a Remote Office 9150 system.

Meridian Internet Gateway Reach Line Card

The Meridian Internet Gateway Reach Line Card (MIG RLC) is installed in the Meridian 1 PBX at the host location. The MIG RLC provides service for up to 16 ports on a 1-slot card, or 32 ports on a 2-slot card. It

emulates a standard digital line card (XDLC), providing PBX functionality for telephones at remote locations (including sites using the Remote Office 9150 unit).

The MIG RLC relays voice and signaling information between the digital telephones connected at the Remote Office 9150 site to the Meridian 1 PBX at the host site. Like the Remote Office 9150 unit, the MIG RLC can route calls over the IP network or the circuit-switched network, or both when the QoS transitioning technology feature is configured.

For a more detailed description, refer to the Meridian Internet Gateway Reach Line Card Installation and Administration Guide (NTP 555-8421-210).

Remote Office 9150 unit

The Remote Office 9150 unit installed in your office provides PBX functionality for up to 32 digital telephones. Voice and signaling information between the digital telephones connected at your office and the MIG RLC installed on the Meridian 1 PBX at the host location is relayed over one or both of the following:

- IP network
- circuit-switched network

10BaseT Ethernet and ISDN BRI connections

These connections provide the voice and data connections between the Remote Office 9150 unit and the host PBX.

Optional trunk interface modules

You can install up to four ISDN BRI U or S/T interface modules in the Remote Office 9150 unit. They provide the interface to the ISDN BRI lines provided by your telephone service provider, and are used to route calls over the circuit-switched network.

Optional Digital Signal Processor application modules

You can install up to three Digital Signal Processor (DSP) application modules to increase the Remote Office 9150 unit's voice processing capacity.

Feature Overview

Introduction

This section provides a brief description of each Remote Office 9150 feature. For a more complete description, refer to the appropriate NTP.

System security

The Remote Office 9150 unit supports three security levels—no security, calling line identification (CLID), and security identifier. The security levels control access from the Remote Office 9150 unit to the MIG RLC on the host PBX.

Trunking

The Remote Office 9150 unit automatically allocates trunk bandwidth, as it is needed. For example, as calls are initiated and bandwidth requirements increase, additional trunk connections are established. Likewise, as calls terminate and bandwidth requirements drop, idle trunks are shut down.

Telephones

The Remote Office 9150 unit supports Meridian digital telephone, telephone modules, and standard calling features.

Supported digital telephones

The following Meridian digital telephones are supported:

- M2008D
- M2008HFD
- M2216D
- M2616D
- M2616CT
- M3820
- M3902
- M3903
- M3904
- M3905

Note: The M2006 and M3901 telephones are also supported, but can be used only for local-controlled calls. These telephones do not have displays, which are required for host PBX functionality.

Note: The M3902, M3903, M3904 and M3905 Release 1 phones are supported. These models will support Release 2 in a later firmware upgrade.

Supported telephone modules

The following telephone modules are supported:

- add-on modules (to add more keys)
- application modules that provide more functionality
- Meridian Communication Adapters (MCA)
- Analog Telephone Adapters (ATA)

Quality of Service transitioning technology

Communications between the Remote Office 9150 unit in your office and the host PBX take place across the IP network using a 10BaseT Ethernet interface. You can configure the Remote Office 9150 unit to switch automatically from the IP network to the circuit-switched network when the voice QoS falls below a predetermined threshold.

Both the MIG RLC and the Remote Office 9150 unit monitor the IP network's QoS constantly. If the IP network QoS degrades, causing poor voice quality, the Remote Office 9150 unit moves, or transitions, the call to the circuit-switched network. When the QoS returns to normal, the Remote Office 9150 unit transitions the call back to the IP network.

Voice over IP features

You can configure the MIG RLC port to which the Remote Office 9150 unit is assigned to automatically move calls from the IP network to the circuit-switched network when the voice QoS falls below a predetermined threshold. When QoS returns to normal, calls are moved back to the IP network.

Call on demand versus permanent connections

The ISDN connection between the MIG RLC and Remote Office 9150 unit can be a permanent or call on demand connection. The connection type is defined on the MIG RLC port to which the Remote Office 9150 unit is assigned. A permanent connection means the ISDN connection to the host PBX always

remains open. A call on demand connection means the ISDN connection opens only when a connection with the host PBX is required. If the connection is defined as call on demand, minimum call duration and idle timers can be configured on the MIG RLC. This helps to reduce ISDN BRI charges.

Port management

Each port on the MIG RLC can be defined as one of the following port types:

- single-user port
Each single-user port supports one remote station at the Remote Office 9150 site.
- multi-user voice port
Up to eight persons can share the same MIG RLC port, but not at the same time. This port type is especially useful for employees who are working in mutually exclusive shifts. All stations that use this type of port respond to the same DN and have identical phone set configurations.
- a port in a dynamic port pool
This is similar to a multi-user port except that the persons who share ports in a dynamic pool are assigned to the next available port in the MIG RLC port pool. There is no correlation between the station and the port on the MIG RLC.
This feature is especially useful in free-seated ACD environments where agents log on to the host PBX using their agent IDs. The MIG RLC administrator can tell you which port types are used by your office.

Station priority

One of the following priority levels can be assigned to each station:

- high
- normal
- circuit only
- IP only

The priority level is defined on the MIG RLC port to which the station is assigned.

Local calling

The Remote Office 9150 unit allows you to place calls to other extensions within your office, or to telephones in your local community. This is accomplished through the use of up to two local call appearance keys.

Note: *If a user initiates the call from the host call appearance key, the station-to-station call requires transmission of signaling data through the host PBX.*

Online/offline table

The online/offline table is configured on the MIG RLC and allows you to schedule times

- when the Remote Office 9150 unit's ISDN BRI connection to the host PBX can be active
Note: *When the Remote Office 9150 unit is in offline mode, users cannot make or receive calls through the host PBX over the IP or circuit-switched network.*
- when all telephones in your office can use only the local PSTN service
This allows you to ensure that costly ISDN BRI telephone calls through the host PBX are disabled after business hours.

Fax support

The Remote Office 9150 unit contains a full-featured analog port that can send and receive faxes.

Emergency service number

If you are using the circuit-switched network to route calls, you can program an emergency service number (such as 911) on the Remote Office 9150 unit. This allows the emergency service call to be routed through the local PSTN instead of through the host PBX, regardless of which call appearance key (host or local) was used to initiate the call.

Note: *If you are using only the IP network to route calls, you should make emergency service calls on a telephone that is directly connected to a PSTN line. If you make an emergency service call from a station that is connected to the Remote Office 9150 unit, the call is routed through the host PBX, which could be in a different city.*

Administrative tools

The Configuration Wizard and Configuration Manager software allow you to perform configuration. Configuration Manager also allows you to perform a variety of administration tasks on the Remote Office 9150 unit, such as changing the administration password viewing the system logs and statistics performing upgrades, backups, and restores.

For more information see the 9150 Installation and Administration Guide NTP: 555-8421-215 NTDR84AA.

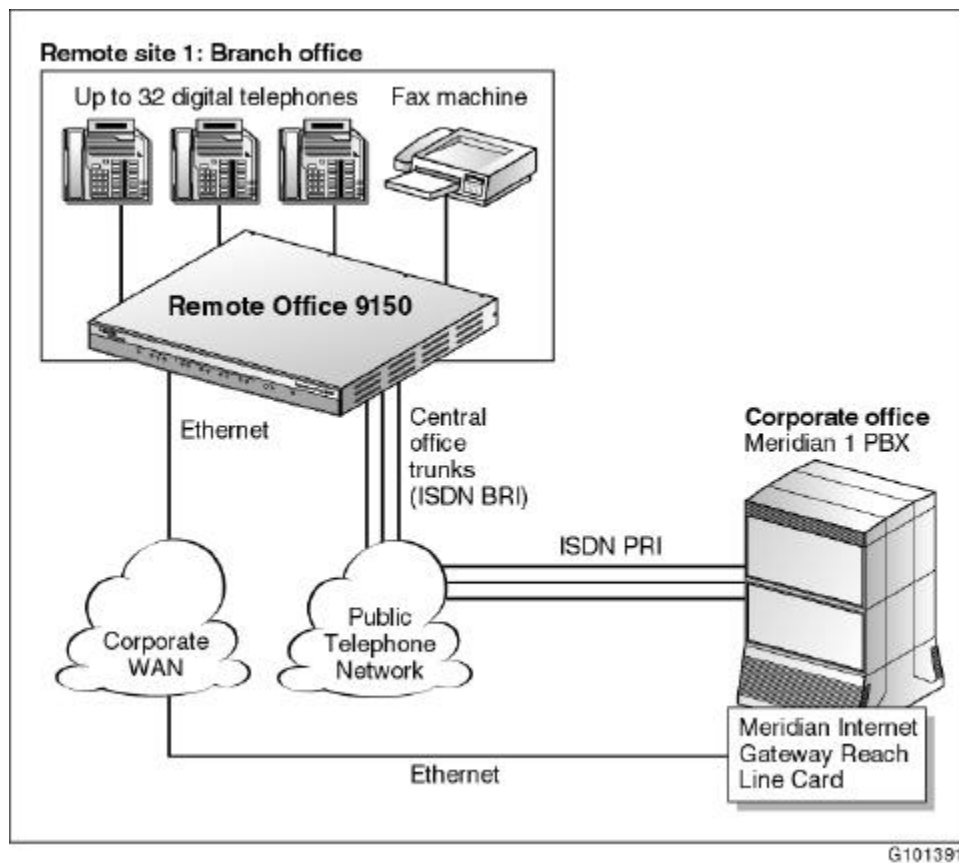
How the Remote Office 9150 unit works

Introduction

There are two major components to the Remote Office 9150 product: the Remote Office 9150 unit located in your office the MIG RLC located on the Meridian 1 PBX at the host site These two components extend the host PBX services to users in your office.

Network diagram

The following diagram shows a MIG RLC and Remote Office 9150 network.



Outgoing call process

To place outgoing calls, users can either pick up the handset on the telephone or press a line appearance key. There are two types of line appearance keys:

- host call appearance key
Use this key to make a call through the host PBX.
- local call appearance keys
Use these keys to make calls to other stations in your office, or to make and receive calls through the local PSTN. You can define up to two local call appearance keys on each digital telephone.

Incoming call process

When a user places a call through the host PBX to a user at the Remote Office 9150 site, a connection is made from the MIG RLC to the Remote Office 9150 unit and the host PBX completes the call normally. If a connection cannot be established, then the call rings until it is forwarded to voice mail by the host PBX.

If the incoming local call is not answered, the call is forwarded to one of the following:

- to the same voice mail provided by the host PBX
To accomplish this, the station must be configured with both local and remote calling capability. The host PBX voice mail service is not available for stations that are defined as local only.

- to another extension in the same office
To accomplish this, one of the local feature keys on the phone set must be defined as Call Forward with the DN of the station to which calls should be forwarded.

Host controlled call mode

When a user places a call to someone at the host site, or when someone from the host site calls the Remote Office 9150 site, the call is in host-controlled call mode. Calls in host-controlled mode are routed through the host PBX.

Local-controlled call mode

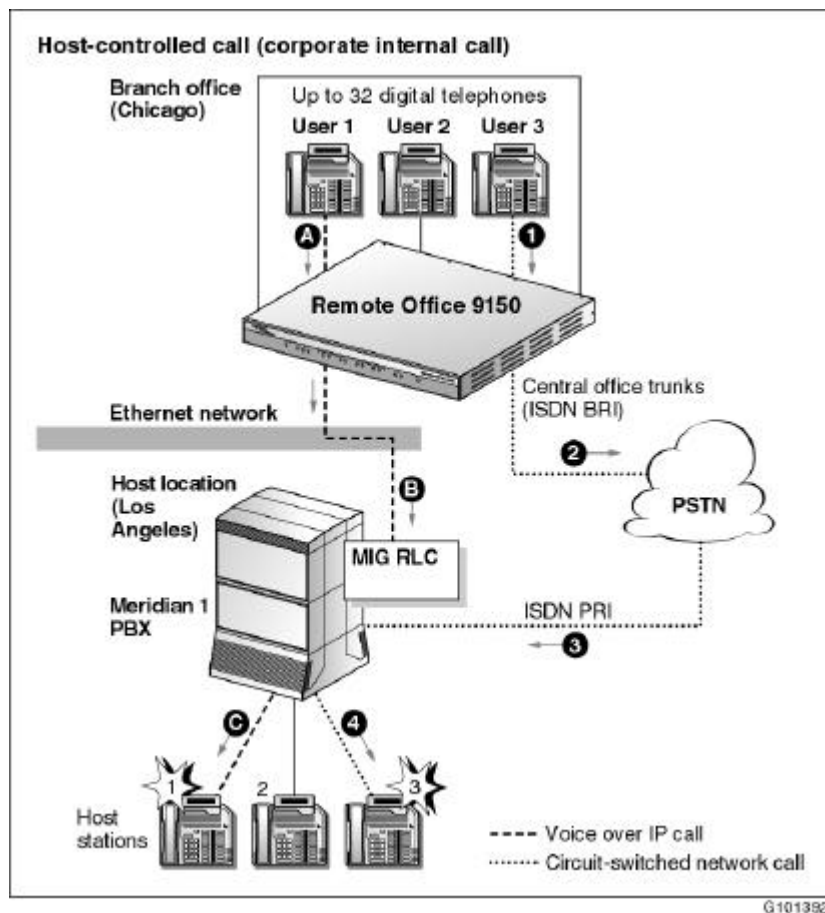
When a user places a call from a local call appearance key the call is in local-controlled mode. Calls that are initiated from the local call appearance key are routed through the local PSTN. Calls to other extensions in the Remote Office 9150 site are routed only through the Remote Office 9150 unit. The host PBX is not involved in local-controlled mode calls.

Quality of Service transitioning technology

If the QoS on the IP network falls below a predefined threshold, you can configure the Remote Office 9150 unit to automatically route voice traffic away from the IP network connection to the circuit-switched connection.

Call scenario 1: host-controlled—internal corporate call

This diagram shows how a call is routed when making a host-controlled call to the corporate office.



The network that is used to route the host-controlled call is transparent to the user, and the dialing requirement is the same for both. Calls work the same way in reverse, from host PBX site to the Remote Office 9150 site.

Voice over IP network call

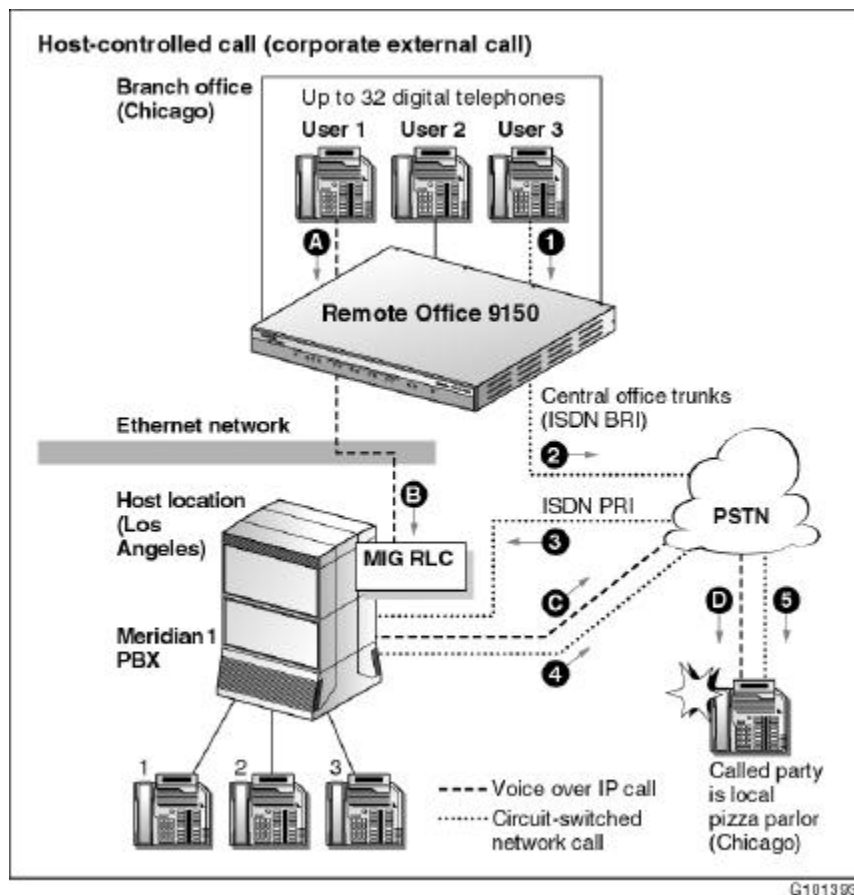
1. User 1 presses the host call appearance key.
Result: User 1 hears a dial tone. This indicates that the connection to the MIG RLC over the IP network was successful.
2. User 1 dials a telephone number (such as the extension number of host station 1).
Result: the Remote Office 9150 unit sends the dialed digits as packets across the Ethernet network. The MIG RLC converts the packets to the format required by the PBX. The PBX then converts the data to voice and routes the call to host station 1.

Circuit-switched network call

1. User 3 presses the host call appearance key.
Result: User 3 hears a dial tone. This indicates that the connection to the MIG RLC over the circuit-switched network was successful.
2. User 3 dials the telephone number (such as the extension number of host station 3).
Result: Dialed digits are sent across the PSTN through the PBX to host station 3.

Call scenario 2: host-controlled—external corporate call

The following diagram shows how a call is routed when making a host-controlled call to a party outside the organization.



The network used to route the call is transparent to the user, and the dialing requirement is the same for both. Calls work the same way in reverse, through the host PBX site to the Remote Office 9150 site.

Voice over IP network call

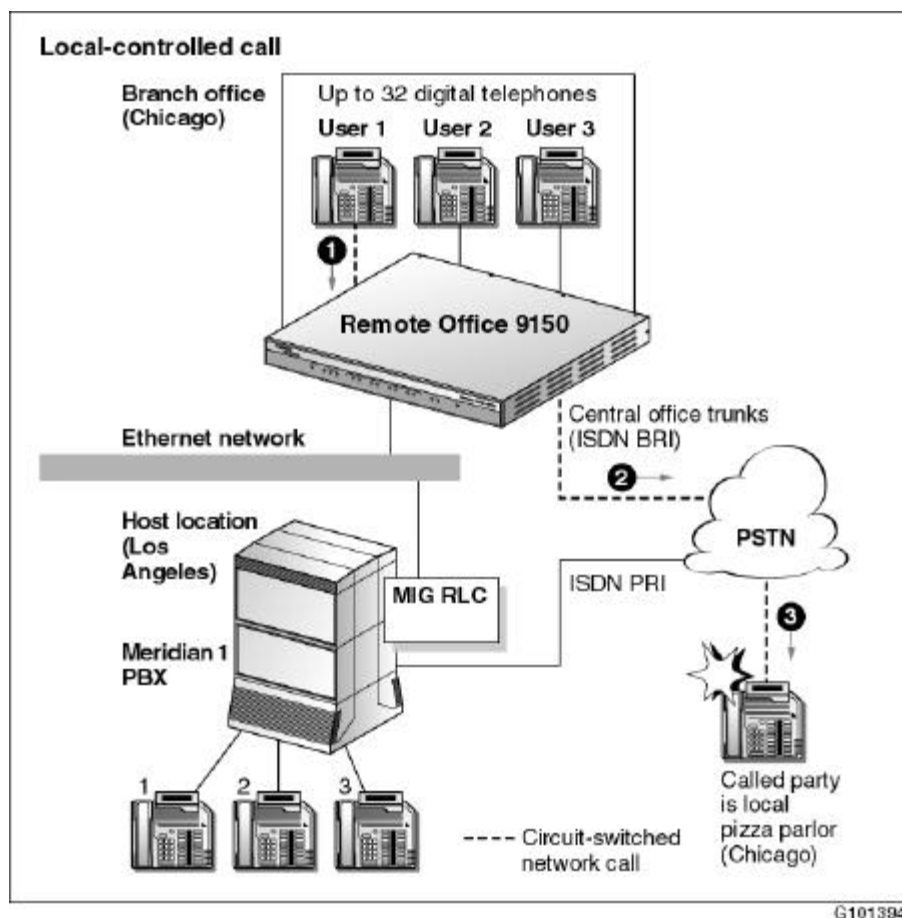
1. User 1 presses the host call appearance key.
Result: User 1 hears a dial tone. This indicates that the connection to the MIG RLC over the IP network was successful.
2. User 1 dials the external telephone number.
Result: the Remote Office 9150 unit sends the dialed digits as packets across the Ethernet network. The MIG RLC converts the packets to the format required by the PBX. The PBX then converts the data to voice and routes the call through the PSTN to the called party.

Circuit-switched network call

1. User 3 presses the host call appearance key.
Result: User 3 hears a dial tone. This indicates that the connection to the MIG RLC over the circuit-switched network was successful.
2. User 3 dials the external telephone number.
Result: Dialed digits are sent across ISDN BRI through the PSTN, through the host PBX to the called party.

Call scenario 3: local-controlled mode—local call

The following diagram shows how a call is routed when making a call within your local area.



Local call

1. User 1 presses the local call appearance key and hears a dial tone from the Remote Office 9150 unit.
2. User 1 then dials a trunk access code (such as #61) and hears a dial tone from the Central Office (PSTN).

Note: If all trunks are busy and unavailable, then User 1 hears a fast busy signal.

3. User 1 dials the telephone number (the pizza parlor in this example). The dialed digits are sent across the ISDN BRI connection through the PSTN to the called party.

Ordering Information / Minimum Hardware Requirements

This section details the ordering information for the Remote Office 9150 and the Remote Office RLC.

The base configuration for the ROU and the RLC allows for 8 simultaneous calls. Increments of 8 simultaneous calls can be added to each device independently in the form of DSPs. Both the ROU and the RLC are field-upgradeable.

To facilitate ease of ordering and configuration, there are marketing packages available:

Package Description	Contents	Product Ordering Number
Remote Office 9150 – 8-user VoIP with 16 port RLC (Opt 11)	Remote Office 9150	NTQR05AA

and 51-81)	RLC – 16 port	
Remote Office 9150 – 8-user VoIP and BRI with 16 port RLC (Opt 11 and 51-81)	Remote Office 9150 BRI Trunk Interface Module (U Interface) RLC – 16 port	NTQR06AA
Remote Office 9150 – 8-user VoIP and BRI with 32 port RLC (Opt 11)	Remote Office 9150 BRI Trunk Interface Module (U Interface) RLC – 32 port (Opt 11)	NTQR08AA
Remote Office 9150 – 8-user VoIP and BRI with 32 port RLC (Opt 51-81)	Remote Office 9150 BRI Trunk Interface Module (U Interface) RLC – 32 port (Opt 51-81)	NTQR07AA
Remote Office 9150 Branch Expansion Package	Remote Office 9150 BRI Trunk Interface Module (U Interface) DSP Application Module	NTQR09AA
Remote Office 9150 8-user Expansion Package	DSP Application Module (9150) DSP Application Module (RLC)	NTQR10AA

Initial configuration of a Remote Office 9150/RLC for 8 simultaneous VoIP (no Quality of Service transitioning or local calling) calls requires:

Unit	Product Ordering Number
Remote Office 9150	NTDR69AA
MIG RLC – 16 port	NTDR68AA
MIG RLC – 32 port – Option 11	NTDR71AA
MIG RLC – 32 port – Option 51-81	NTDR70AA

In order to support Quality of Service transitioning and/or local calling, it is necessary to add the BRI trunk module to the ROU. Up to 4 such modules can be added. The connection to the RLC takes place across the backplane through an existing digital trunk card (PRI/T1/E1).

Unit	Product Ordering Number
BRI Trunk Interface Module – U Interface	NTDR74AA

The BRI Trunk Interface Module's remote call handling capacity is dependent on the voice compression algorithm used. 16k of the first BRI's first B-Channel is dedicated to X.11 signaling. When local calls are made across the PSTN, the entire B-channel is used and there is no compression.

Codec	Host Calls per BRI Trunk Module			
	1	2	3	4
G.711	1	3	5	7
G.726	3	7	11	15
G.729A	14	30	32	32

To expand the number of simultaneous calls, a DSP must be added to the ROU and the RLC. The DSP Applications Modules are interchangeable between the ROU and the RLC.

Unit	Product Ordering Number
DSP Application Module	NTDR73AA

Connecting multiple ROUs to one RLC

Each RLC can handle up to 4 ROUs with a total of either 16 or 32 calls. A 16 port RLC can handle 4 ATA or MCA devices. A 32 port RLC can handle 7 devices.

ROU

Each North American version ROU includes the following items:

Unit	Product Ordering Number
Remote Office 9150 Unit	NTDR69AA
North America Power Cord	A0292928
Remote Office 9150 Universal Power Supply	NTDR87AA
Serial Cable – 9-pin	N/A
Rack-Mount Hardware / Rubber Feet	N/A
9150 Installation and Administration Guide NTP: 555-8421-215	NTDR84AA
9150, 911x Series and MIG RLC Release Notes NTP: 555-8421-102	P0909817
Remote Office Product CD-ROM	NTDR81AA



The ROU can be rack or wall mounted.

RLC

Each RLC contains the following components:

Unit	Product Ordering Number
MIG RLC 16 port OR	NTDR68AA
MIG RLC 32 port Option 11 OR	NTDR71AA
MIG RLC 32 port Option 51-81	NTDR70AA
RLC Cable – Basic	NTDR79AA

Installer's Notes	P0909814
9150, 911x Series and MIG RLC Release Notes NTP: 555-8421-102	P0909817
Remote Office Product CD-ROM	NTDR81AA



16 Port – Single Wide Slot



32 Port – Double Wide Slot

Configuration Manager Software

The Configuration Manager software is included with each 9150 purchased. Operating systems supported are:

- Windows 95 (version B)
- Windows 98
- WinNT Workstation 4.0 (Service Pack 5 or higher)

The Configuration Manager software is supported on the same machine as Optivity Telephony Manager 1.0. There may be limitations dependent on the order of installation.

It is primarily used for initial install of the PC. It can also be ordered as:

Unit	Product Ordering Number
Remote Office Product CD-ROM	NTDR81AA

To configure the ROU or RLC there is a quick-install Wizard that will prompt for basic information for a "barebones" configuration. Once connectivity and basic functionality has been established, other parameters can be fine-tuned.

Along with the 9150 and MIG RLC NTPs there are a set of worksheets that will help in the documentation, installation and configuration of each device. It is recommended that they be followed.

Engineering Guidelines

For a more complete discussion of the engineering aspects, please refer to the 9150 and MIG RLC NTPs (9150 Installation and Administration Guide, NTDR84AA - NTP: 555-8421-215).

It is important to understand the bandwidth and timing aspects of Voice over IP in relation to a particular network environment. There are 3 primary concerns:

- Packet Loss
- Network Delay
- Network Jitter

In the tables below the perceived quality levels are shown using network delay and packet loss. As a rule of thumb, network delay in excess of 300ms is normally not considered acceptable. Before installation, a

determination should be made as to whether or not the network will be able to successfully pass VoIP traffic.

TCP traffic behavior

The majority of corporate intranet traffic is TCP-based. Unlike UDP, which has no flow control, TCP uses a sliding window flow control mechanism. Under this scheme, TCP increases its window size, increasing throughput until congestion occurs. Congestion is detected by packet losses, and when that happens, the throughput is quickly throttled down, and the whole cycle repeats.

When multiple TCP sessions flow over few bottleneck links in the intranet, the flow control algorithm can cause TCP sessions in the network to throttle at the same time, resulting in a periodic and synchronized surge and ebb in traffic flows. WAN links appear to be congested at one time, and are then followed by a period of under-utilization. There are two consequences:

- poor efficiency of WAN links
- unfairly affected Remote Office traffic streams

Internet Protocols and ports used by Remote Office

The following IP applications and protocols are used by Remote Office and must be transmitted across your intranet by all IP routers and other network equipment:

- TCP port 12800
- UDP ports
- IP stack

TCP port 12800

Remote Office uses well-known TCP port 12800 to establish a signaling session over TCP between the MIG RLC and each Remote Office 9150 unit. The encapsulation over TCP is a proprietary format that encodes the X.11 signaling.

UDP ports

Remote Office uses two well-known UDP ports to establish TCP sessions. It uses 20482 for testing during QoS recovery transition. It uses 20480 to multiplex all the active voice traffic. The formats of the voice and pseudo-port traffic are both proprietary. They contain a 12-byte header in addition to the voice payload, which is dependent upon the algorithm (for example, G729). Each voice packet contains 30 milliseconds of voice payload, so the size of the voice packet varies according to the algorithm used.

IP stack

The IP stack does not contain a routing protocol. It relies on the default gateway to do routing. It is fully compliant to IP Version 4 and supports ICMP and ARP. It is compatible with Ethernet 802.3 and Ethernet II networks.

Proprietary trunk protocol and HDLC encapsulation

Remote Office uses a proprietary trunk protocol when communicating over ISDN, and HDLC encapsulation when transferring packetized voice. Both the signaling and voice payloads are multiplexed over the same channel. Further, the multi-link protocol allows distribution of the information over several independent B-channels. The protocol uses a compressed voice header so that, in best-case scenarios, only five bytes of overhead (opening and closing HDLC flag, 16-bit CRC, and 1-byte header) are used in addition to the payload.

Meridian 1 and SL-1 are trademarks of Nortel Networks.